

NSF CROSSCUTTING INVESTMENT STRATEGIES

This section contains a partial listing of cross-directorate programs sponsored by the National Science Foundation (NSF). Activities not mentioned here may appear elsewhere in this publication. Refer to the appropriate directorate.

- **NSF Priority Multidisciplinary Areas**
- **Human Resource and Career Development**
- **Crosscutting Research, Instrumentation, and Partnering Programs**

For More Information

Visit the NSF Crosscutting Programs home page, <http://www.nsf.gov/home/crssprgm>.

NSF PRIORITY MULTIDISCIPLINARY AREAS

The National Science Foundation's (NSF) investments in priority areas reach across science and engineering and bring new knowledge to bear on areas of great national interest. NSF works with other Government agencies to identify and support these priority multidisciplinary areas. The goal is to accelerate scientific and technical progress by identifying and addressing gaps in knowledge and barriers that prevent progress.

The priority multidisciplinary areas that NSF has selected for increased attention during the next several years are

1. **Biocomplexity in the Environment**
2. **Information Technology Research**
3. **Learning for the 21st Century**
4. **Nanoscale Science and Engineering**

The priority multidisciplinary areas in this section address NSF's three strategic goals:

1. **People** – A diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens.
2. **Ideas** – Discovery at and across the frontier of science and engineering, and connections to its use in the service of society.
3. **Tools** – Broadly accessible, state-of-the-art, and shared research and education tools.

1. Biocomplexity in the Environment

The environment is a subject of profound national importance and scientific interest, making it a strategic priority for NSF. The goals of the Foundation's increasing investment in this area include enhancement of fundamental environmental research in all relevant disciplines and in interdisciplinary and long-term research; creation of educational opportunities that build scientific and technological capacity; discovery of innovative methods that avoid environmental harm and inform the decisionmaking process; and support for advanced physical, technological, informational, and international infrastructure.

A centerpiece of NSF's Environmental Research and Education portfolio is the Biocomplexity in the Environment (BE) competition. Initiated in fiscal year 1999, this special competition promotes comprehensive, integrated investigations of environmental systems using advanced scientific and engineering methods.

Biocomplexity refers to the dynamic web of often surprising interrelationships that arise when components of the global ecosystem—biological, physical, chemical, and the human dimension—interact. Investigations of biocomplexity in the environment are intended to provide a more complete understanding in the areas of natural processes; human behaviors and decisions in the natural world; and ways to use new technology effectively to observe the environment and sustain the diversity of life on Earth.

By placing biocomplexity studies in an environmental context, this competition emphasizes research with the following characteristics: strong interdisciplinary nature; focus on complex environmental systems, including interactions of nonhuman biota and humans; and focus on systems with high potential for exhibiting nonlinear or highly coupled behavior with other systems.

Beginning with the fiscal year 2001 competition, and planned for the fiscal year 2002 competition as well, four

interdisciplinary areas are being emphasized:

- Dynamics of Coupled Natural and Human (CNH) Systems—Emphasizes quantitative understanding of short- and long-term dynamics of natural capital. Also emphasized are how humans value and influence ecosystem services and natural resources, including consideration of landscapes and land use; and the influence of uncertainty, resilience, and vulnerability in complex environmental systems on societal institutions.
- Coupled Biogeochemical Cycles (CBC)—Focuses on the interrelation of biological, geochemical, geological, and physical processes at all temporal and spatial scales, with particular emphasis on understanding linkages between cycles and the influence of human and other biotic factors on those cycles.
- Genome-Enabled Environmental Science and Engineering (GEN-EN)—Encourages the use of genetic information to understand ecosystem functioning and the adaptation of organisms to ecological roles.
- Instrumentation Development for Environmental Activities (IDEA)—Supports the development of instrumentation and software that relies on and uses microelectronics, photonics, telemetry, robotics, sensing systems, modeling, data mining, and analysis techniques to bring recent laboratory instrumentation advances to bear on the full spectrum of environmental biocomplexity questions.
- Materials Use: Science, Engineering, and Society (MUSES)—Supports projects that study the reduction of adverse human impact on the total interactive system of resource use, and the design and synthesis of new materials with environmentally benign impacts on biocomplex systems, as well as maximizing the efficient use of

individual materials throughout their life cycles.

For More Information

See program announcement NSF 01-34 (or its successor); or visit the NSF Environmental Research and Education web site, <http://www.nsf.gov/ere>. Additional information on anticipated multidisciplinary BE activities in materials-use science and engineering; environmental informatics; social adaptation to hazards; and molecular scale and genomic studies of subsurface processes will be posted on the web site.

2. Information Technology Research (ITR)

Sustained leadership in the United States in information technology requires an aggressive Federal program to create new knowledge in a variety of areas. The U.S. economy's robust growth has in part resulted from new ideas that became the basis for new products. For example, NSF contributed greatly to the development of today's Internet. NSF's investments—in ideas, people, and tools—have benefited greatly from the application of information technology.

NSF faces two major challenges and opportunities with respect to information technology. The first challenge is to support the people, ideas, and tools that will create and advance knowledge in all areas of information science and engineering. Wholly new computational approaches are needed for problems arising from the science and engineering disciplines and the development of new learning technologies for use in education.

The second challenge is to upgrade the computational and computing infrastructures for all fields that NSF supports. Researchers and educators in many areas need to incorporate information technology and, in some cases, revolutionize their experimental

and collaborative processes to attain new effectiveness and greater efficiency. Also, the United States must address a range of access and workforce issues. Overcoming inequities will require innovative educational technologies such as highly interactive computer science courseware that is both multicultural and multimedia.

NSF is the lead agency for a multiagency 5-year research initiative in information technology. Each agency participating in the initiative will define specific programs in keeping with that agency's mission. NSF is primarily responsible for basic research to advance knowledge, and for education and workforce development activities. The multiyear Information Technology Research investment by NSF will lead to the following outcomes:

- Advancement of fundamental knowledge in techniques for computation, the representation of information, the manipulation and visualization of information, and the transmission and communication of information.
- Enhanced knowledge about how to design, build, and maintain large, complex software systems that are reliable, predictable, secure, and scalable.
- New knowledge about distributed and networked systems and interactions among component parts, as well as the interaction of systems with both individuals and cooperating groups of users. Such networks can empower a broadly distributed scientific community to participate fully in frontline research.
- Development of a significantly advanced high-end computing capability needed to solve myriad important science and engineering problems.
- Increased understanding of the societal, ethical, and workforce

implications of the information revolution.

- A strong information technology workforce and a citizenry capable of using information technology effectively.

For More Information

See program announcement NSF 01-149; or visit the ITR web site at <http://www.itr.nsf.gov/>.

3. Learning in the 21st Century

Leadership in the United States in the concept-based, innovation-led global economy of the next century will depend on the success of building and sustaining a competent and diverse scientific, mathematics, engineering, and technology (SMET) workforce, drawing on all elements of the Nation's rich human resources.

The SMET education continuum extends from preK through elementary and secondary, to undergraduate, graduate, and continuing professional education. The level, quality, and accessibility of SMET education depend on the following: understanding the nature of learning; strategically enabling an improved science- and technology-based educational enterprise; and building an infrastructure to broaden participation of all members of our society.

Across the NSF, organizations provide disciplinary and interdisciplinary support to integrate research and education, as well as new tools and models for K–12, undergraduate, and graduate education. These activities will recognize the importance of the SMET content of educational programs for K–12 students and for the instructional workforce.

A National Digital Library for SMET education will provide ready access to the highest quality education materials, pedagogy, and research on learning, and will enhance the quality of graduate,

undergraduate, K–12, and public science education.

The outcome of NSF's sustained investment in research, education, training, and human resource programs will be

- enhanced knowledge about how humans learn;
 - enhanced practices throughout the SMET education enterprise—especially at the K–12 level—leading to improved teacher performance and student achievement; and
 - a more inclusive and globally engaged SMET enterprise that fully reflects the strength of America's diverse population.
- enhanced methods for the synthesis and processing of engineered, nanometer-scale building blocks for materials and system components;
 - new device concepts and system architecture appropriate to the unique features and demands of nanoscale engineering;
 - development of a new generation of skilled workers who have the multidisciplinary perspective necessary for rapid progress in nanotechnology; and
 - increased understanding of societal, ethical, and workforce implications of nanoscience and nanotechnology.

4. Nanoscale Science and Engineering

Nanoscale science and engineering promises to produce a dominant technology for the 21st century. Control of matter at the nanoscale level underpins innovation in critical areas, from information and medicine to manufacturing and the environment.

One nanometer (one billionth of a meter) is a magical point on the dimensional scale. Nanostructures are at the confluence of the smallest of human-made devices and the largest molecules of living systems. Biological cells such as red blood cells have diameters in the range of thousands of nanometers. Microelectromechanical systems are now approaching this same scale. This means we are now at the point of connecting machines to individual cells.

Twelve Federal agencies have joined together to promote advances in nanotechnology, in which NSF has the largest investment. NSF's nanoscale science and engineering program is a multiyear investment whose goals include the following:

- discovery of novel phenomena, processes, and tools;

For More Information

See the latest program solicitation, available on the nano program web site, <http://www.nsf.gov/nano/>.

HUMAN RESOURCE AND CAREER DEVELOPMENT

Among NSF's crosscutting investments are programs directed to the development of a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well-prepared citizens. This section of the Guide highlights programs for human resource and career development that are supported as NSF-wide, as well as specific crosscutting programs of the Directorate for Education and Human Resources (EHR).

NSF sponsors a number of activities directed specifically at bringing members of underrepresented groups into the science and engineering education pipeline and preparing them for potential advancement to the highest levels of leadership. These activities are among those described in this section.

To locate programs that pertain specifically to underrepresented groups, see “Programs for Groups Underrepresented in Science and Engineering.”

One of the Foundation’s goals is to promote a science and engineering workforce that is globally engaged. To help meet this goal, the Division of International Programs—located in the Directorate for Social, Behavioral, and Economic Sciences (SBE)—offers a variety of programs. For further information, see the SBE section in this Guide, or visit the Division of International Programs web site, <http://www.nsf.gov/sbe/int/>.

The programs and activities described in this section are organized in the following categories:

- **Programs at the Undergraduate Level**
- **Programs at the Graduate and Postdoctoral Level**
- **Specialized Multilevel Programs**
- **Programs for Faculty and Institutional Development**
- **Programs for Groups Underrepresented in Science and Engineering**

For More Information

For further information about programs for human resource and career development, visit the NSF Crosscutting Programs home page, <http://www.nsf.gov/home/crssprgm>.

For further information about programs managed by the EHR Directorate, including programs for underrepresented groups, visit the following EHR Division home pages:

- Division of Human Resource Development,
<http://www.ehr.nsf.gov/EHR/HRD>
- Division of Undergraduate Education,
<http://www.ehr.nsf.gov/EHR/DUE>
- Division of Graduate Education,
<http://www.ehr.nsf.gov/EHR/DGE/>

PROGRAMS AT THE UNDERGRADUATE LEVEL

Activities to enhance undergraduate education in science and engineering are supported throughout NSF. In particular, the **Division of Undergraduate Education (DUE)** in EHR offers focused programs for the education of technologists, primarily through community colleges, and for the education of future teachers. On a broader scale, DUE supports course, curriculum, and laboratory improvement aimed at all undergraduate students, both nonmajors and majors in science and engineering. In addition, some of NSF’s disciplinary directorates offer programs in support of course development. Information on these can be found in the directorate sections of this Guide.

NSF is committed to the education of a science and engineering workforce drawn broadly from the Nation’s talent pool. To increase diversity at the undergraduate level, NSF offers the **Louis Stokes Alliances for Minority Participation**.

To provide opportunities for participation in research, NSF supports the Research Experiences for Undergraduates (REU).

The REU Program supports active research participation by undergraduate students in science and engineering disciplines supported by NSF. REU projects involve students in meaningful ways in ongoing research and education programs or in projects specially designed for the purpose. Two support mechanisms are offered: REU Supplements and REU Sites. REU Supplements may be included in proposals for new or renewal NSF grants or as supplements to ongoing NSF-funded projects. REU Sites are based on independent proposals to initiate and

conduct undergraduate research and education projects for a number of students. REU Sites projects are often focused within a single discipline and/or single academic department; however, interdisciplinary or multiple-department proposals with a strong intellectual focus are also encouraged, as are proposals with international dimensions. Undergraduate student participants supported with NSF funds in either Supplements or Sites must be citizens or permanent residents of the United States or its possessions.

For More Information

For program announcement NSF 01-121, a list of contact people, a list of current REU Sites, and other guidance, visit the REU web site, <http://www.nsf.gov/home/crssprgm/reu/start.htm>.

PROGRAMS AT THE GRADUATE AND POSTDOCTORAL LEVEL

NSF is a major supporter of graduate and postdoctoral education in science and engineering. The majority of this support is embedded in awards to institutions through funds to support graduate research assistants and postdoctoral associates. NSF also supports fellowships and traineeships in the following programs:

- **Graduate Research Fellowships*** (see <http://www.ehr.nsf.gov/dge/programs/grf/>)
- **Integrative Graduate Education and Research Traineeship (IGERT) Program*** (see <http://www.nsf.gov/home/crssprgm/igert/start.htm>)

- **NSF Graduate Teaching Fellows in K-12 Education*** (see <http://www.ehr.nsf.gov/dge/programs/gk12/>)

*Note: Graduate students supported as Fellows or Trainees in these programs must be citizens or permanent residents of the United States or its possessions.

NSF is committed to the education of a science and engineering workforce drawn broadly from the Nation's talent pool. To increase diversity at the graduate level and beyond, NSF offers the **Alliances for Graduate Education and the Professoriate** (see <http://www.ehr.nsf.gov/hrd/agep.asp>).

Postdoctoral Fellowships

In addition to supporting postdoctoral associates through NSF research awards to institutions, NSF offers a number of postdoctoral fellowship programs in specific disciplines.

For More Information

A complete list of NSF postdoctoral fellowship programs, including contact names, brief program descriptions, links to program announcements, and other helpful information, is available on the NSF FastLane System, <https://www.fastlane.nsf.gov/d11/D11Menu.htm>.

The following table also lists current postdoctoral fellowship programs and contact information.

| FELLOWSHIP | CONTACT |
|---|---|
| Minority Postdoctoral Research Fellowships in Biological, Social, Behavioral, and Economic Sciences (NSF 00-139) | <ul style="list-style-type: none"> • BIO Minority Research Fellowships Biological Infrastructure National Science Foundation 4201 Wilson Blvd., Rm 615 Arlington, VA 22230 Tel: 703-292-8470 http://www.nsf.gov/bio/dbi/dbitraining.htm • SBE Minority Research Fellowships Cross-Directorate Activities National Science Foundation 4201 Wilson Blvd., Rm 995 Arlington, VA 22230 Tel: 703-292-8763 http://www.nsf.gov/sbe/ses/ip/start.htm |
| Postdoctoral Research Fellowships in Biological Informatics (NSF 98-162) | Postdoctoral Research Fellowships in Biological Informatics Biological Infrastructure National Science Foundation 4201 Wilson Blvd., Rm 615 Arlington, VA 22230 Tel: 703-292-8470 http://www.nsf.gov/bio/dbi/dbitraining.htm |
| Postdoctoral Research Fellowships in Microbial Biology (99-142) | Postdoctoral Research Fellowships in Microbial Biology Biological Infrastructure National Science Foundation 4201 Wilson Blvd., Rm 615 Arlington, VA 22230 Tel: 703-292-8470 http://www.nsf.gov/bio/dbi/dbitraining.htm |
| CISE Postdoctoral Research Associates in Experimental Computer Science (97-169) | Division of Experimental and Integrative Activities National Science Foundation 4201 Wilson Blvd., Rm 1160 Arlington, VA 22230 Tel: 703-292-8980 http://www.cise.nsf.gov/eia/index.html |
| NSF-NATO Postdoctoral Fellowships in Science and Engineering (NSF 00-145) | NATO Postdoctoral Fellowship Program Division of Graduate Education |

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| | <p>National Science Foundation 4201 Wilson Blvd., Rm 907 Arlington, VA 22230 Tel: 703-292-8630 http://www.ehr.nsf.gov/dge/programs/nato/</p> |
| <p>Graduate Student Industrial Fellowship</p> <ul style="list-style-type: none"> • Postdoctoral Industrial Fellowship | <p>Dr. Donald Senich Division of Design, Manufacture, and Industrial Innovation National Science Foundation 4201 Wilson Blvd., Rm 527 Arlington, VA 22230 Tel: 703-292-8330</p> |
| <p>Ridge Interdisciplinary Global Experiments (RIDGE) Postdoctoral Fellowship Program (NSF 95-132)</p> | <p>Division of Ocean Sciences National Science Foundation 4201 Wilson Blvd., Rm 725 Arlington, VA 22230 Tel: 703-292-8580</p> |
| <p>NSF Astronomy and Astrophysics Postdoctoral Fellowships (NSF 00-136)</p> | <p>Division of Astronomical Sciences National Science Foundation 4201 Wilson Blvd., Rm 1045 Arlington, VA 22230 Tel: 703-292-8820 e-mail: aapf@nsf.gov</p> |
| <p>MPS Distinguished International Postdoctoral Research Fellowships (NSF 00-142 and NSF 00-143)</p> | <ul style="list-style-type: none"> • Division of Astronomical Sciences Rm 1045; Tel: 703-292-8820 • Division of Chemistry Rm 1055; Tel: 703-292-8840 • Division of Materials Research Rm 1065; Tel: 703-292-8810 • Division of Mathematical Sciences Rm 1025; Tel: 703-292-8870 • Division of Physics Rm 1015; Tel: 703-292-8890 <p>National Science Foundation 4201 Wilson Blvd. Arlington, VA 22230</p> |
| <ul style="list-style-type: none"> • Mathematical Sciences Postdoctoral Research Fellowships (with Research | <p>Infrastructure Program Division of Mathematical Sciences National Science Foundation</p> |

| | |
|--|---|
| <p>Instructorship option) (NSF 01-126)</p> <ul style="list-style-type: none"> • Mathematical Sciences University/Industry Postdoctoral Research Fellowships | <p>4201 Wilson Blvd., Rm 1025 Arlington, VA 22230 Tel: 703-292-8870 e-mail: msprf@nsf.gov http://www.nsf.gov/mps/divisions/dms/start.htm</p> |
| <p>International Research Fellowships (NSF 01-135)</p> | <p>International Research Fellowship Program Division of International Programs National Science Foundation 4201 Wilson Blvd., Rm 935 Arlington, VA 22230 Tel: 703-292-8711 http://www.nsf.gov/sbe/int/fellows/start.htm</p> |
| <p>Japan Society for the Promotion of Science (JSPS) Postdoctoral Awards for U.S. Researchers</p> | <p>JSPS Postdoctoral Awards Division of International Programs National Science Foundation 4201 Wilson Blvd., Rm 935 Arlington, VA 22230 Tel: 703-292-8704 e-mail: NSFJinfo@nsf.gov http://www.nsf.gov/sbe/int/start.htm</p> |

SPECIALIZED MULTI-LEVEL PROGRAMS

Some NSF programs approach human resource and career development by addressing these issues across several education levels. This approach is used in activities aimed at improving the recruitment and retention of women in careers in science and engineering and at realizing the potential for careers in science and engineering for persons with disabilities. Programs of this type include the following:

- **Program for Gender Equity in Science, Mathematics, Engineering, and Technology**
- **Program for Persons with Disabilities**

Facilitation Awards for Scientists and Engineers with Disabilities

The Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) encourage the participation of scientists and engineers with disabilities (including investigators and other staff, postdoctoral associates, student research assistants, and awardees and honorable mention recipients for graduate fellowships) in NSF programs. This effort provides funds for equipment and for the necessary assistance specifically required for the performance of research on an NSF-supported project. A request for support may be included in a new proposal submitted to any NSF program or in a request for a supplement to an existing NSF grant. When making a request, be sure to check the box "Facilitation for Scientists/Engineers with Disabilities" on NSF Form 1207. Information is also available in program announcement NSF 91-54.

PROGRAMS FOR FACULTY AND INSTITUTIONAL DEVELOPMENT

One of NSF's core strategies is the integration of research and education. This strategy is embodied in NSF's premier program for early career faculty and in its presidential awards component. NSF also supports faculty members from predominantly undergraduate institutions by enduring their substantial contributions to research and education. Special research and education opportunities are available for these faculty as well as for faculty who are underrepresented minorities. A new pilot program aims to increase the participation and advancement of women in academic careers in science and engineering. Faculty and institutional development opportunities are available from NSF through the following programs:

1. **Faculty Early Career Development**
2. **NSF Component of the Presidential Early Career Awards for Scientists and Engineers**
3. **Research in Undergraduate Institutions and Research Opportunity Awards**
4. **Minority Research Planning Grants and Career Advancement Awards**
5. **ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers**
6. **Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring**

To ensure a broad national base for research, NSF emphasizes developing the research capacity of faculty across a range of institutions, including not only the predominantly undergraduate institutions previously mentioned, but also institutions that have had low participation in NSF programs in the past. The **Experimental Program to Stimulate Competitive Research (EPSCoR)** (see <http://www.ehr.nsf.gov/epscor/>) is an example of this emphasis.

The following are three examples of specialized programs aimed at the enhancement of research and education in minority-serving institutions:

- **Historically Black Colleges and Universities—Undergraduate Program** (see <http://www.ehr.nsf.gov/hrd/hbcu.asp>)
- **Tribal Colleges and Universities Program** (see <http://www.ehr.nsf.gov/EHR/HRD/tcup.asp>)
- **Centers for Research Excellence in Science and Technology** (see <http://www.ehr.nsf.gov/hrd/Crest.asp>)

1. Faculty Early Career Development (CAREER)—An NSF-wide activity that supports junior faculty within the context of their overall career development. It combines in a single program research support and education of the highest quality. CAREER emphasizes the importance NSF places on the early development of academic careers dedicated to stimulating the discovery process in which the excitement of research is enhanced by inspired teaching and enthusiastic learning.

For More Information

Visit the CAREER web site, <http://www.nsf.gov/home/crssprgm/career/start.htm>.

2. NSF Component of the Presidential Early Career Awards for Scientists and Engineers (PECASE)—Each year, NSF selects up to 20 nominees for PECASE. Nominees are selected from among the most meritorious first-year awardees supported by the Faculty Early Career Development (CAREER) Program (see description of CAREER above). PECASE recognizes outstanding scientists and engineers who early in their careers show exceptional potential for leadership at the frontiers of knowledge. This Presidential award is the highest honor bestowed by the U.S. Government on scientists and engineers who are beginning their independent careers.

For More Information

Information about PECASE, including eligibility factors and other pertinent information, is available on the PECASE web site, <http://www.nsf.gov/pecase/>.

3. Research in Undergraduate Institutions (RUI)—Supports research by faculty members from predominantly undergraduate institutions by funding (1) individual and collaborative research projects; (2) the purchase of shared-use research instrumentation; and (3) Research Opportunity Awards for work with NSF-supported investigators from other institutions (these three types of support are described below).

All NSF directorates participate in the RUI activity. RUI proposals are evaluated and funded by the NSF program in the disciplinary area of the proposed research. The objectives of RUI are to support high-quality research, strengthen the research environment in academic departments that are oriented primarily toward undergraduate instruction, and promote the integration of research and education.

The involvement of undergraduate students in a research-rich learning environment is an important feature of RUI. However, the primary purpose of RUI is to support faculty research, thereby maintaining the intellectual vibrancy of faculty members in the classroom and research community.

RUI provides the following types of support:

- Single-Investigator and Collaborative Faculty Research Projects—Provides support through NSF research programs in response to proposals submitted by individual faculty members or by groups of collaborating investigators. RUI proposals differ from standard NSF proposals in that they include an RUI Impact Statement describing the expected effects of the proposed research on the research and education environment of the institution. Please note: the Directorate for Biological

Sciences has special instructions for Collaborative Research at Undergraduate Institutions (C-RUI). See NSF 01-9 for further details.

- Shared Research Instrumentation and Tools—Provides support for (1) the purchase or upgrade of instrumentation or equipment necessary to support research that will be conducted by several faculty members and (2) the development of new instrumentation.

- Research Opportunity Awards (ROA's)—Enable faculty members at predominantly undergraduate institutions to pursue research as visiting scientists with NSF-supported investigators at other institutions. ROA's are usually funded as supplements to ongoing NSF research grants. ROA's are intended to increase visitors' research capability and effectiveness; improve research and teaching at their home institution; and enhance the NSF-funded research of the host principal investigator.

For More Information

For further information about the RUI activity, including guidelines for the

preparation and submission of proposals, visit the RUI web site, <http://www.ehr.nsf.gov/crssprgm/rui/start.shm>.

Prospective applicants for RUI grants and principal investigators interested in hosting an ROA visiting researcher are urged to contact a program officer in the appropriate discipline.

4. Minority Research Planning Grants and Career Advancement Awards—

These awards are part of NSF's overall effort to give members of minority groups that are underrepresented in science and engineering greater access to science and

engineering research and education support.

- Minority Research Planning Grants (MRPG's)—Enable PIs who have not had prior independent Federal research support to develop competitive research projects by supporting preliminary studies and similar activities. These are one-time awards of up to \$18,000 for a maximum of 18 months.

- Minority Career Advancement Awards (MCAA's)—Support activities that can expand the research career potential of promising applicants. These awards are limited to approximately \$50,000 for 12 months and in general are one-time nonrenewable grants.

For More Information

The submission deadline date varies with each program. For additional information, contact the appropriate discipline. Information is also available in program announcement NSF 94-147.

5. ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers—

Seeks to improve the climate for women in U.S. academic institutions and facilitate the advancement of women to the highest ranks of academic leadership. This pilot program especially encourages the use of creative approaches by men and women to meet these goals.

ADVANCE provides award opportunities for individuals and organizations through the following:

- Fellows Awards—Enable promising individuals to establish or reestablish full-time independent academic research and education careers in institutions of higher learning.

- Institutional Transformation Awards—Support academic institutional transformation to promote the increased participation and advancement of women scientists and engineers in academe.
- Leadership Awards—Recognize the outstanding contributions made to date by organizations and individuals that have enabled the increased participation and advancement of women in academic science and engineering careers; and enable awardees to sustain, intensify, and initiate new activities designed to make further progress.

Members of underrepresented minority groups and individuals with disabilities are encouraged to apply for an award.

For More Information

Visit the ADVANCE web site,
<http://www.nsf.gov/home/crssprgm/advance/>.

6. Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM)—Administered by NSF on behalf of the White House, the PAESMEM Program seeks to identify outstanding mentoring efforts and programs that are designed to enhance the participation of groups traditionally underrepresented in science, mathematics, and engineering.

For More Information

See program announcement NSF 01-54; or visit the PAESMEM web site,
<http://www.ehr.nsf.gov/ehrd/paesmem.asp>.

PROGRAMS FOR GROUPS UNDERREPRESENTED IN SCIENCE AND ENGINEERING

NSF has a number of special programs that address members of groups underrepresented in science and

engineering. Activities are aimed at increasing the participation of underrepresented minorities (among minorities, these groups include American Indians/Alaska Natives [Native Americans], Blacks [African Americans], Hispanics, and Pacific Islanders); improving the recruitment and retention of women and girls in science and engineering careers; and ensuring that persons with disabilities have the opportunity to participate fully in NSF-supported projects. Such efforts include programs for students, faculty, and institutions designed to develop as fully as possible our Nation's talent pool.

The following is a list of these programs and activities, with reference to their accompanying publication, for further information.

DIRECTORATE FOR BIOLOGICAL SCIENCES (BIO):

- Minority Postdoctoral Research Fellowships and Supporting Activities (NSF 00-139)

DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING (CISE):

- CISE Minority Institutions Infrastructure (NSF 96-15)
- Information Technology Workforce Program (Dear Colleague Letter NSF 01-33)
- CISE Research Resources (NSF 01-100)

Division of Human Resource Development (HRD), DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES (EHR):

- Alliances for Graduate Education and the Professoriate (NSF 00-53)
- Centers of Research Excellence in Science and Technology (NSF 98-19)
- Tribal Colleges and Universities Program (NSF 01-61)
- Historically Black Colleges and Universities Undergraduate Program (NSF 00-131)
- Louis Stokes Alliances for Minority Participation (NSF 01-14)
- Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring (NSF 00-41)
- Program for Gender Equity in Science, Mathematics, Engineering, and Technology (NSF 01-6)
- Program for Persons with Disabilities (NSF 01-67)

DIRECTORATE FOR ENGINEERING (ENG):

- Biomedical Engineering and Research to Aid Persons with Disabilities (NSF 01-12)
- Supplemental Funding for Support of Women, Minorities, and Physically Disabled Engineering Research Assistants (see <http://www.eng.nsf.gov/eec/suppfund.htm>)

DIRECTORATE FOR GEOSCIENCES (GEO):

- Opportunities for Enhancing Diversity in the Geosciences (NSF 01-36)

DIRECTORATE FOR SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES (SBE):

- Minority Postdoctoral Research Fellowships (NSF 00-136)

FOUNDATION-WIDE ACTIVITIES:

- Minority Research Planning Grants and Career Advancement Awards (NSF 94-147). All inquiries should be directed to the appropriate disciplinary program officer.
- Facilitation Awards for Scientists and Engineers with Disabilities (NSF 91-54)
- ADVANCE (NSF 01-69)

CROSSCUTTING RESEARCH, INSTRUMENTATION, AND PARTNERING PROGRAMS

The programs and activities described in this section are as follows:

1. **Grant Opportunities for Academic Liaison with Industry**
2. **Partnerships for Innovation**
3. **Innovation and Organizational Change**
4. **Global Change Research Programs**
5. **Partnership for a New Generation of Vehicles**
6. **International Programs**
7. **Small Business Innovation Research Program and**
8. **Small Business Technology Transfer Program**
9. **Small Grants for Exploratory Research**
10. **Science and Technology Centers: Integrative Partnerships**
11. **Major Research Instrumentation**
12. **Collaboratives to Integrate Research and Education**

1. Grant Opportunities for Academic Liaison with Industry (GOALI)—Aims to synergize university/industry partnerships by making funds available to support these linkages. The program supports (a) faculty, postdoctoral fellows, and students to conduct research and gain experience in an industrial setting; (b) industry scientists and engineers to bring industrial perspective and integrative skills to academe; and (c) interdisciplinary university/industry teams to conduct long-term projects. The program targets high-risk and high-gain research, with focus on fundamental topics that would not otherwise have been undertaken by industry; the development of innovative, collaborative university/industry educational programs; and the direct exchange of new knowledge between academe and industry. GOALI provides (a) funding for individuals such as faculty, postdoctoral fellows, and students to develop creative modes of collaborative interaction with industry through individual or small-group research projects; and (b) industry-based fellowships for graduate students and postdoctoral fellows. All NSF Directorates participate in the GOALI Program at this time.

For More Information

See program announcement NSF 98-142; or visit the GOALI web site, <http://www.nsf.gov/goali/>.

2. Partnerships for Innovation (PFI)—Seeks to stimulate innovation by supporting partnerships among colleges and universities, State and local governments, the private sector, and other relevant organizations, thus emphasizing the productive connections between new knowledge created in the discovery process and learning and innovation.

For the purpose of this program, innovation explicitly extends to training and developing people and tools and creating organizational conditions necessary to foster the transformation of knowledge into products, processes, systems, and services that will fuel economic development, create wealth, and generate improvement in the national

standard of living. Key factors in the innovation enterprise include creating and accessing new knowledge, a scientifically and technologically literate workforce, and infrastructure that will enable innovation. Concurrently, the PFI Program addresses

NSF's strategic intention to broaden participation of people and institutions in NSF activities.

The goals of the PFI Program are

- to catalyze partnerships for innovation that will enable the transformation of knowledge created by the national research and education enterprise into innovations that create new wealth, build strong local, regional, and national economies; and improve the national well-being;
- to broaden the participation of all types of academic institutions and of citizens in NSF activities to better meet the broad workforce needs of the national innovation enterprise; and
- to create enabling infrastructure necessary to foster and sustain innovation for the long term.

Examples of proposals that might be submitted to the PFI Program are those that include planning and/or implementation of new models for innovation; education and training activities that explicitly address the workforce needs of the innovation enterprise; and development and deployment of new tools or mechanisms that support the innovation infrastructure. They may seek to create an activity focusing on a critical level of innovation in a technological area in an industrial sector or in a geographical region. The outcomes for proposed activities should foster economic and/or societal well-being that can be self-sustaining in the long-term. The lead organization must be a degree-granting academic institution of higher learning. At a minimum, proposed partnerships must include private-sector organizations or State/local government entities.

For More Information

Contact John C. Hurt, Program Director, by telephone, 703-292-5332; or by e-mail, jhurt@nsf.gov. A complete list of awards made by the program including project descriptions is available at <http://www.nsf.gov/od/lpa/news/press/00/pr0068.htm>. Further information is also available in program announcement NSF 01-79.

3. Innovation and Organizational Change (IOC)

—Seeks to improve the performance of industrial, educational, service, health care, government, and other organizations and institutions through the support of research on theories, concepts, and methodologies of innovation and organizational change. To foster innovation and manage change, we need to understand effective approaches to organizational learning and redesign; strategic and cultural change; quality and process improvement; innovation; new product and service development; and the development and integration of new technologies. The program supports research using theory combined with empirical validation to clarify effective approaches to organizational learning and redesign; strategic and cultural change; quality and process improvement; innovation; new product and service development; and the development and integration of new technologies.

IOC is jointly sponsored by the Directorates for Social, Behavioral, and Economic Sciences; Engineering; and Education and Human Resources.

For More Information

Visit the program's web site at <http://www.nsf.gov/sbe/ses/ioc/start.htm>.

4. Global Change Research Programs (GCRP's)

—NSF GCRP's support research and related activities that advance fundamental understanding of dynamic physical, biological, and socioeconomic systems as well as interactions among those systems. In addition to research on Earth system processes and the consequences of changes in those systems, NSF programs facilitate data acquisition and data management activities necessary for basic research on global change, promote the enhancement of modeling designed to improve representation of Earth system interactions, and develop advanced analytic methods to facilitate fundamental research. NSF also supports fundamental research on processes to identify and evaluate responses to changing global environmental conditions.

For More Information

A list of NSF-sponsored global change research programs and further information about each is available on the GCRP web site at <http://www.nsf.gov/geo/egch/>.

5. Partnership for a New Generation of Vehicles (PNGV)

—PNGV is a historic public/private partnership between the Federal Government (including 7 agencies and 19 Federal laboratories) and DaimlerChrysler, Ford, and General Motors Corporations that aims to strengthen America's competitiveness by developing technologies for a new generation of vehicles.

PNGV's long-term goals are (1) to develop an environmentally friendly car with up to triple the fuel efficiency of today's midsize cars; (2) to significantly improve national competitiveness in automotive manufacturing; and (3) to apply commercially viable innovation to conventional vehicles. PNGV's success is important to the country for a number of reasons, primarily jobs and global competitiveness (one out of every seven jobs in the United States is automotive related); reduction of U.S. dependence on foreign oil (the United States currently

imports 50 percent of the oil it consumes); and environmental factors (automobiles are a major contributor to atmospheric carbon dioxide, a greenhouse gas).

For More Information

Write to the PNGV Secretariat, U.S. Department of Commerce, Herbert Hoover Building, Room 4845, 14th Street & Constitution Ave., NW, Washington, DC 20230; or contact by telephone, 202-482-6260, or by fax, 202-482-6275. To inquire via e-mail, send messages to pngv-info@ta.doc.gov with "PNGV Question" as the subject line.

6. International Programs—Support of international activities is an integral part of NSF's mission to promote the progress of U.S. science and engineering. In particular, NSF recognizes the importance of (1) enabling U.S. researchers and educators to advance their work through international collaboration and (2) helping ensure that future generations of U.S. scientists and engineers gain professional experience overseas early in their careers. Consistent with the international character of science and engineering, disciplinary programs throughout NSF offer support to U.S. scientists and engineers for the international aspects of their research when those aspects are judged to be important to the specific objectives of those activities.

The Division of International Programs (INT) in the Social, Behavioral, and Economic Sciences Directorate expands and facilitates the international dimensions of NSF's mission by promoting new partnerships between U.S. scientists and engineers and their foreign colleagues. Most INT programs are organized on a regional or country basis. Prospective applicants should also consider international opportunities supported by other parts of NSF and elsewhere.

For More Information

Information and guidelines on proposal preparation for international programs and

activities are available in program announcement NSF 00-138; or visit the INT web site at <http://www.nsf.gov/sbe/int>.

7. Small Business Innovation Research Program and Small Business Technology Transfer Program—

- **Small Business Innovation Research (SBIR) Program**—NSF encourages small businesses to submit high-quality proposals that focus on important science, engineering, and science/engineering education problems and opportunities and that will lead to significant commercial and public benefit. The SBIR Program is a Government-wide program intended to stimulate technological innovation, use small-business concerns to meet Federal research and development (R&D) needs, foster and encourage the participation of minority and disadvantaged persons in technological innovation, and increase the commercialization by the private sector of innovations resulting from Federal R&D.

SBIR uses a uniform three-phase process. Phase I is a 6-month effort designed to evaluate the feasibility of an idea based on its scientific and technical merit. Phase II builds on the feasibility study and leads to the development of a model or prototype. Phase III is the commercialization phase. Development of a partnership with another funding source is strongly encouraged and is one of the measures used in the evaluation of Phase II proposals. SBIR funds are not used for Phase III efforts.

SBIR is highly competitive and supports the Nation's small high-tech businesses, universities, and research institutions that are able to convert basic ideas and research into commercial products that will enhance the Nation's productivity and help maintain its competitive leadership in the international marketplace.

The small business can partner with other businesses or nonprofit institutions such as academic or Government

laboratories. In Phase I, the partner's participation can be 33 and a third percent, and in Phase II, up to 50 percent. Members of academic institutions can participate either through a subcontract to the institution or as consultants.

i For More Information about SBIR

Visit the SBIR web site at <http://www.eng.nsf.gov/sbir/>.

- **Small Business Technology Transfer (STTR) Program**—Also a Government-wide program, STTR differs from SBIR in that it requires the small business to engage in cooperative research with nonprofit research institutions. STTR is also a three-phase process. Phase I is a 12-month effort that determines scientific, technical, and commercial merit and establishes concept feasibility and eligibility for Phase II. Phase II further develops the proposed idea while taking into consideration scientific, technical, and commercial merit; Phase I results; and other relevant information. Phase III involves the commercial application of the research funded in Phases I and II. STTR funds are not used for Phase III efforts.

STTR is highly competitive and supports the Nation's small high-tech businesses, universities, and research institutions that are able to convert basic ideas and research into commercial products that will enhance the Nation's productivity and help maintain its competitive leadership in the international marketplace.

The small business must partner with a federally funded research and development center, university, or nonprofit institution. In both Phase I and Phase II, the participation must amount to a minimum of 40 percent of the effort for the small-business concern and 30 percent of the effort for the research institution. Members of the academic or research institution participate through a subcontract to the institution. Before

starting Phase I, the partners make an agreement that covers rights to the technology involved in the proposal.

i For More Information

Visit the STTR web site at <http://www.eng.nsf.gov/sbir/>.

8. Small Grants for Exploratory Research (SGER)—Proposals for small-scale, exploratory, and high-risk research in the fields of science, engineering, and education normally supported by NSF may be submitted to individual programs. Such research is characterized as preliminary work on untested and novel ideas; ventures into emerging research ideas; the application of new expertise or new approaches to “established” research topics; having extreme urgency with regard to availability of or access to data, facilities, or specialized equipment, including quick-response research on natural disasters and similar unanticipated events; and efforts of similar character likely to catalyze rapid and innovative advances.

NSF strongly encourages investigators to contact the NSF program officer(s) most germane to the proposal topic before submitting an SGER proposal. This will make it easier to determine whether the proposed work meets the SGER guidelines described here and the availability for funding, or whether it would be more suitable for submission as a fully reviewed proposal.

The project description must be two to five pages long. It should include a clear statement that explains why the proposed research should be considered particularly exploratory and high risk and the nature and significance of its potential impact on the field. In addition, an explanation should be included as to why an SGER grant would be the best means of supporting the work.

Brief biographical information is required for the principal investigator (PI) and co-PI(s) only, and should include a list of no more than five significant publications or other

research products. The box for “Small Grant for Exploratory Research” must be checked on the cover sheet.

These proposals will be subject to internal NSF merit review only. Renewed funding of SGER awards may be requested only through submission of a non-SGER proposal that will be subject to full merit review. The maximum SGER award amount will not exceed \$100,000. Although the maximum award amount is \$100,000, the award amount usually will be substantially less than a given program’s average award amount. The project’s duration will normally be 1 year, but may be up to 2 years.

For participating directorates and at the discretion of the program officer with the concurrence of the division director, a small fraction of especially promising SGER awards may be extended for up to 6 additional months and supplemented with up to \$50,000 in additional funding.

These award extensions will be possible for awards with an initial duration of 2 years or less. Requests for extensions must be submitted 1 to 2 months before the expiration date of the initial award. A project report and an outline of the proposed research (not to exceed five pages) must be included.

9. Science and Technology Centers: Integrative Partnerships (STC)—The STC Program was established in 1987 to fund important basic research and education activities and to encourage technology transfer and innovative approaches to interdisciplinary activities. Since its inception, 30 comprehensive STC’s have been established.

The STC’s explore new areas and build bridges among disciplines, institutions, and other sectors. They offer the research community an effective mechanism to embark upon long-term scientific and technological research activities, explore better and more effective ways to educate students, and develop mechanisms to ensure the timely transition of research and

education advances made into service in society.

For More Information

Write to the Office of Integrative Activities (OIA), National Science Foundation, 4201 Wilson Boulevard, Room 1270, Arlington, VA 22230; or contact by telephone, 703-292-8040, or by e-mail, nsf_oia@nsf.gov; or visit the OIA home page at <http://www.nsf.gov/od/oia/start.htm>.

10. Major Research Instrumentation (MRI)—Is designed to improve the condition of scientific and engineering (S&E) equipment used for research and research training in our Nation’s academic institutions. The program works to improve the quality and expand the scope of research and research training in S&E and foster the integration of research and education by providing instrumentation for research-intensive learning environments.

The MRI Program assists in the acquisition or development by U.S. institutions of major research instrumentation that is generally too costly to support through other NSF programs. Maintenance and technical support associated with these instruments is also supported. Proposals may be for a single instrument, a large system of instruments, or multiple instruments that share a common research focus. Computer systems, clusters of advanced workstations, networks, and other information infrastructure components necessary for research are supported.

For More Information

Write to the Office of Integrative Activities (OIA), National Science Foundation, 4201 Wilson Boulevard, Room 1270, Arlington, VA 22230; or contact by telephone, 703-292-8040, or by e-mail, nsf_oia@nsf.gov; or visit the OIA home page, <http://www.nsf.gov/od/oia/start.htm>.
<http://www.nsf.gov>

11. Collaboratives to Integrate

Research and Education (CIRE)—CIRE

was created to establish long-term research and education relationships between minority-serving institutions and NSF-supported facilities and centers. CIRE's long-term goal is to formally establish these developing relationships by negotiating formal institution-to-institution agreements for their continuation and support. Examples of the types of activities supported by CIRE are (1) the development of collaborative and mutually beneficial research and education projects that may include infrastructure enhancement at the minority-serving institution, if needed, to support the proposed collaborative activity; and (2) exchanges of faculty and students. It should be noted however, that CIRE is not a general infrastructure program for minority-serving institutions. Funds to support CIRE-like activities come from the cognizant research directorate. Therefore, communication should be made with the Office of the Assistant Director of the cognizant directorate.

For More Information

Write to the Office of Integrative Activities (OIA), National Science Foundation, 4201 Wilson Boulevard, Room 1270, Arlington, VA 22230; or contact by telephone, 703-292-8040, or by e-mail, nsf_oia@nsf.gov; or visit the OIA home page, <http://www.nsf.gov/od/oia/start.htm>.